What is claimed is:

1. A method for labeling synthesis of ketones, comprising:

(a) providing a high pressure reaction chamber having a liquid inlet and a gas inlet in a bottom surface thereof,

(b) providing a solution to be labeled comprising a triflate, a boronic acid mixed with a transitional metal complex,

(c) introducing a carbon-isotope monoxide enriched gas-mixture into the reaction chamber of the UV reactor assembly via the gas inlet,

(d) introducing at high pressure said solution mixed with transition metal complex into the reaction chamber via the liquid inlet,

(e) waiting for a predetermined time while the labeling synthesis occur, and

(f) removing the labeled ketones from the reaction chamber.

2. A method of claim 1, wherein the carbon-isotope monoxide enriched gas-mixture is produced by a method comprising:

(a) providing carbon-isotope dioxide in a suitable carrier gas,

(b) converting carbon-isotope dioxide to carbon-isotope monoxide by introducing said gas mixture in a reactor device,

(c) trapping carbon-isotope monoxide in a carbon monoxide trapping device, wherein carbon-isotope monoxide is trapped but not said carrier gas, and

(d) releasing said trapped carbon-isotope monoxide from said trapping device in a well defined micro-plug, whereby a volume of carbon-isotope monoxide enriched gas-mixture is achieved.

3. A method of claim 1, wherein the carbon-isotope is ^{11}C, ^{13}C, or ^{14}C.

4. A method of claim 1, wherein the carbon-isotope is ^{11}C.

5. A method of claim 1, wherein the step of introducing the solution to be labeled mixed with a transitional metal complex is performed using a pressure that is about

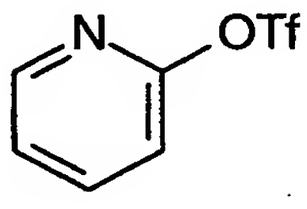
80 times higher than the pressure before the introduction, in order to maintain a pseudo one-phase system.

6. A method of claim 1, wherein the step of waiting a predetermined time comprises adjusting the temperature of the reaction chamber to enhance the labeling synthesis.

7. A method of claim 1, wherein the transitional metal complex is a palladium metal complex.

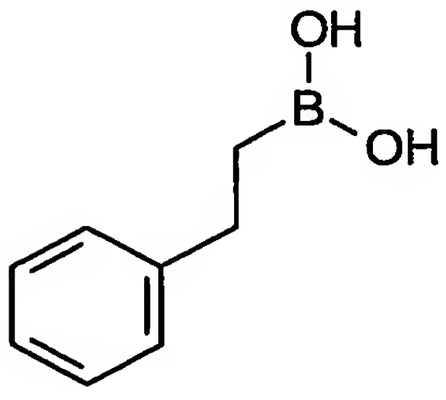
8. A method of claim1, wherein the triflate has a formula R1-OTf, wherein R1 is linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl.

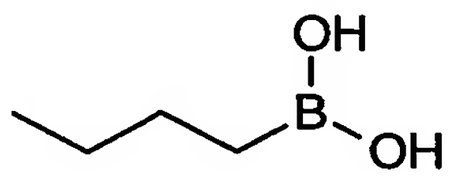
9. A metod of claim 8, wherein R1 is selected from C_6H_5, 4-CH_3O-C_6H_4, 4-CH_3-C_6H_4, 4-NO_2-C_6H_4, $C_{10}H_7$ or

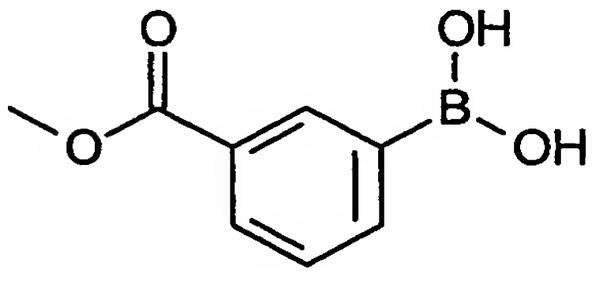


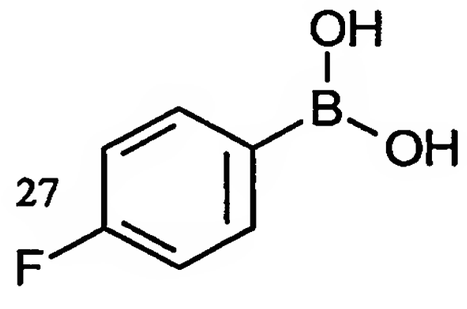
10. A method of claim 1, wherein the boronic acid has a formula a formula $RB(OH)_2$, wherein R is linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl.

11. A method of claim 10, wherein R is selected from phenyl, methyl,









or theinyl.

12. A method of claim 1, wherein the solution to be labeled is further mixed with lithium bromide to facilitate the reaction.

13. A labeled ketone synthesized according to a method of claim 1 having a formula of R1-C*O-R, wherein * is labeled carbon position, and R1 and R are independently linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl.

14. A method of labeling synthesis of amines comprising:

(a) synthesizing a labeled ketone of claim 13,

(b) reductive aminate the labeled ketone with different amines in the presence of $TiCl_4$ and $NaBH_3CN$.

15. A method claim 14, wherein the amines of step (b) having a formula R'R"NH, wherein R' is H, linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl, R" is linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl.

16. A labeled amine synthesized according to method 14 having a formula of

wherein * is labeled carbon position, and R1 and R are independently linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl, R' is H, linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl, R" is linear or cyclic alkyl or substituted alkyl, aryl or substituted aryl.

17. A kit for PET study comprising a carbon-isotope labeled ketone of claim 13.

18. A kit for PET study comprising a carbon-isotope labeled ketone of claim 16.

19. A kit of claim 18, further comprising radioprotectant, antimicrobial preservative, pH-adjusting agent or filler.

20. A kit of claim 19, wherein the radiopretectant is selected from ascorbic acid, para-aminobenzoic acid, gentisic acid and salts thereof.

21. A kit of claim 19, wherein the antimicrobial preservative is selected from the parabens, benzyl alcohol, phenol, cresol, cetrimide and thiomersal.

22. A kit of claim 19, wherein the pH-adjusting agent is a pharmaceutically acceptable buffer or a pharmaceutically acceptable base, or mixtures thereof.

23. A kit of claim 19, wherein the filler is inorganic salts, water soluble sugars or sugar alcohols.